SYMBOL	**DESCRIPTION**
$f(\ )$	ALICE'S AND BOB'S COMBINING FUNCTION
I_A, I_B	ALICE'S AND BOB'S DISCARDABLE INITIALIZATION VECTOR
K_A, K_B	ALICE'S AND BOB'S PRIVATE SESSION KEY
M_A, M_B	ALICE'S AND BOB'S PUBLIC KEY
N_A, N_B	ALICE'S AND BOB'S RANDOM NONCE FOR KEY VERIFICATION
N_A+1, N_B+1	MODIFIED (INCREMENTED) RANDOM NONCES
α, ß	ALICE'S AND BOB'S CONGRUENT EXPONENTIAL BASE; (ALICE'S AND BOB'S MODULO VARIABLE)
P_A, P_B	ALICE'S AND BOB'S SECRET PASSWORDS
R_A, R_B	ALICE'S AND BOB'S PRIVATE RANDOM NUMBERS
S_A, S_B	ALICE'S AND BOB'S HIGH-ENTROPY SECRET
$(Y)_X$	ENCRYPT CLEARTEXT, Y, WITH KEY X
$(Z)^{-1}_X$	DECRYPT CIPHERTEXT, Z WITH KEY X
$(N_B)\Sigma^{n}_{i=2}$	SUPERENCRYPT PLAINTEXT, N_B, WITH VARIABLE KEYS n

FIG. 1

200

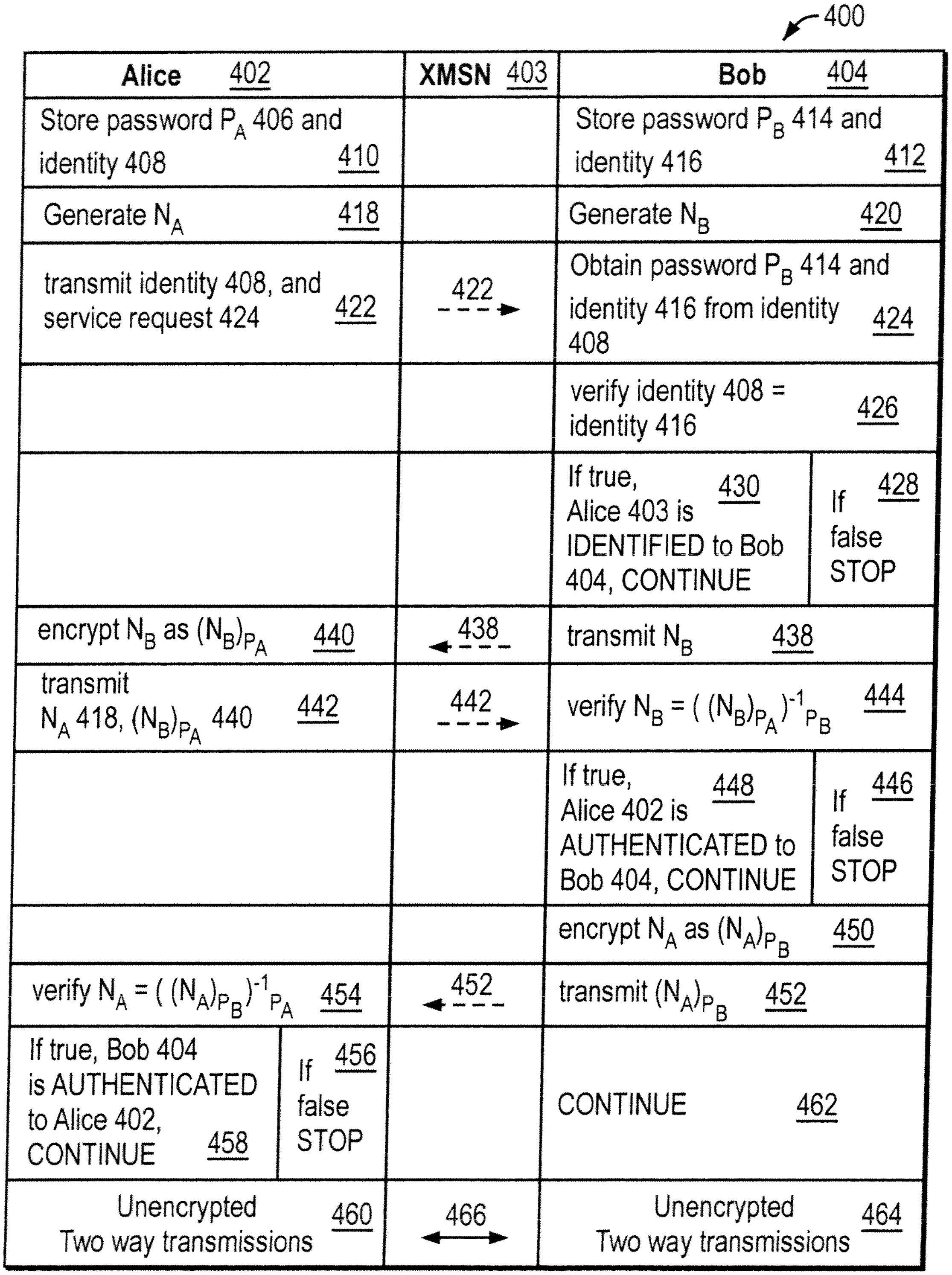
Alice 202	**XMSN** 203	**Bob** 204
Generate R_A 206		Generate R_B 208
$M_A = \alpha^{R_A}$ mod ß 210		$M_B = \alpha^{R_B}$ mod ß 212
transmit M_A 214	214 →	$K_B = (M_A)^{R_B}$ mod ß 216
$K_A = (M_B)^{R_A}$ mod ß 220	← 218	transmit M_B 218
CONTINUE 222		CONTINUE 226
Encrypted Two way transmissions 224	230 ↔	Encrypted Two way transmissions 228

FIG. 2 *(Prior Art)*

300

Alice 202	**XMSN** 303	**Bob** 204
Generate N_A 302		Generate N_B 304
encrypt N_A as $(N_A)_{K_A}$ 306		
transmit $(N_A)_{K_A}$ 308	308 →	$N_A = ((N_A)_{K_A})^{-1}{}_{K_B}$ 310
		increment N_A as N_A+1 312
		encrypt $(N_B, N_A+1)_{K_B}$ 314
N_B 320, N_A+1 322 = $((N_B, N_A+1)_{K_B})^{-1}{}_{K_A}$ 318	316 ←	transmit $(N_B, N_A+1)_{K_B}$ 316
increment N_B as N_B+1 324		
encrypt $(N_B+1)_{K_A}$ 326		
transmit $(N_B+1)_{K_A}$ 328	328 →	$N_B+1 = ((N_B+1)_{K_A})^{-1}{}_{K_B}$ 330
verify N_A+1 332		verify N_B+1 340
If true, Bob 204 and Alice 202 share the same session key ($K_A = K_A$) CONTINUE 336 334 If false STOP		342 If false STOP If true, Alice 202 and Bob 204 share the same session key ($K_A = K_A$) CONTINUE 344
Encrypted Two way transmissions 338	348 ↔	Encrypted Two way transmissions 346

FIG. 3 *(Prior Art)*



Alice 402	XMSN 403	Bob 404
Store password P_A 406 and identity 408 410		Store password P_B 414 and identity 416 412
Generate N_A 418		Generate N_B 420
transmit identity 408, and service request 424 422	422 - - - →	Obtain password P_B 414 and identity 416 from identity 408 424
		verify identity 408 = identity 416 426
		If true, Alice 403 is IDENTIFIED to Bob 404, CONTINUE 430 If false STOP 428
encrypt N_B as $(N_B)_{P_A}$ 440	← - - - 438	transmit N_B 438
transmit N_A 418, $(N_B)_{P_A}$ 440 442	442 - - - →	verify $N_B = ((N_B)_{P_A})^{-1}{}_{P_B}$ 444
		If true, Alice 402 is AUTHENTICATED to Bob 404, CONTINUE 448 If false STOP 446
		encrypt N_A as $(N_A)_{P_B}$ 450
verify $N_A = ((N_A)_{P_B})^{-1}{}_{P_A}$ 454	← - - - 452	transmit $(N_A)_{P_B}$ 452
If true, Bob 404 is AUTHENTICATED to Alice 402, CONTINUE 458 If false STOP 456		CONTINUE 462
Unencrypted Two way transmissions 460	466 ←→	Unencrypted Two way transmissions 464

FIG. 4

500

Alice 502	XMSN 503	Bob 504
Store password P_A 506 and identity 508 510		Store password P_B 514 and identity 516 512
Generate R_A 518		Generate R_B 522 and N_B 524 520
$M_A = (\alpha)^{R_A}$ mod ß 526		$M_B = (\alpha)^{R_B}$ mod ß 528
transmit identity 508, M_A 526, and service request 532 530	530 - - - →	Obtain password P_B 514 and identity 516 based on identity 508 534
		verify identity 508 = identity 516 536
		544 If true, Alice 502 is IDENTIFIED to Bob 504; CONTINUE If false 538 542 generate random P_B 542; CONTINUE 540 STOP
		$K = K_B = (M_A)^{R_B}$ mod ß 546
		$S = S_B = f\,(P_B, M_A, M_B)$ 548
		encrypt N_B as $(N_B)_S$ 550
		encrypt $(N_B)_S$ as $((N_B)_S)_K$ 552
$K = K_A = (M_B)^{R_A}$ mod ß 556	← - - - 554	transmit M_B, $((N_B)_S)_K$ 554
$S = S_A = f\,(P_A, M_A, M_B)$ 558		
$N_B = ((((N_B)_S)_K)^{-1}{}_K)^{-1}{}_S$ 560		
Generate N_A 562		
modify N_B as $N_{B_A}+1$ 564		
encrypt N_A, N_B+1 as $(N_A, N_B+1)_S$	566	
encrypt $(N_A, N_B+1)_S$ as $((N_A, N_B+1)_S)_K$	568	
transmit $((N_A, N_B+1)_S)_K$ 570	570 - - - →	N_A 574, N_B+1 576 = $((((N_A, N_B+1)_S)_K)^{-1}{}_K)^{-1}{}_S$ 572
		verify N_B+1 576 – 1 = N_B 524 578
		If true, Alice 502 is AUTHENTICATED to Bob 504; CONTINUE 580 If false STOP 579
One way transmissions 582	582 →	Open one way link 581 generate I_B 583

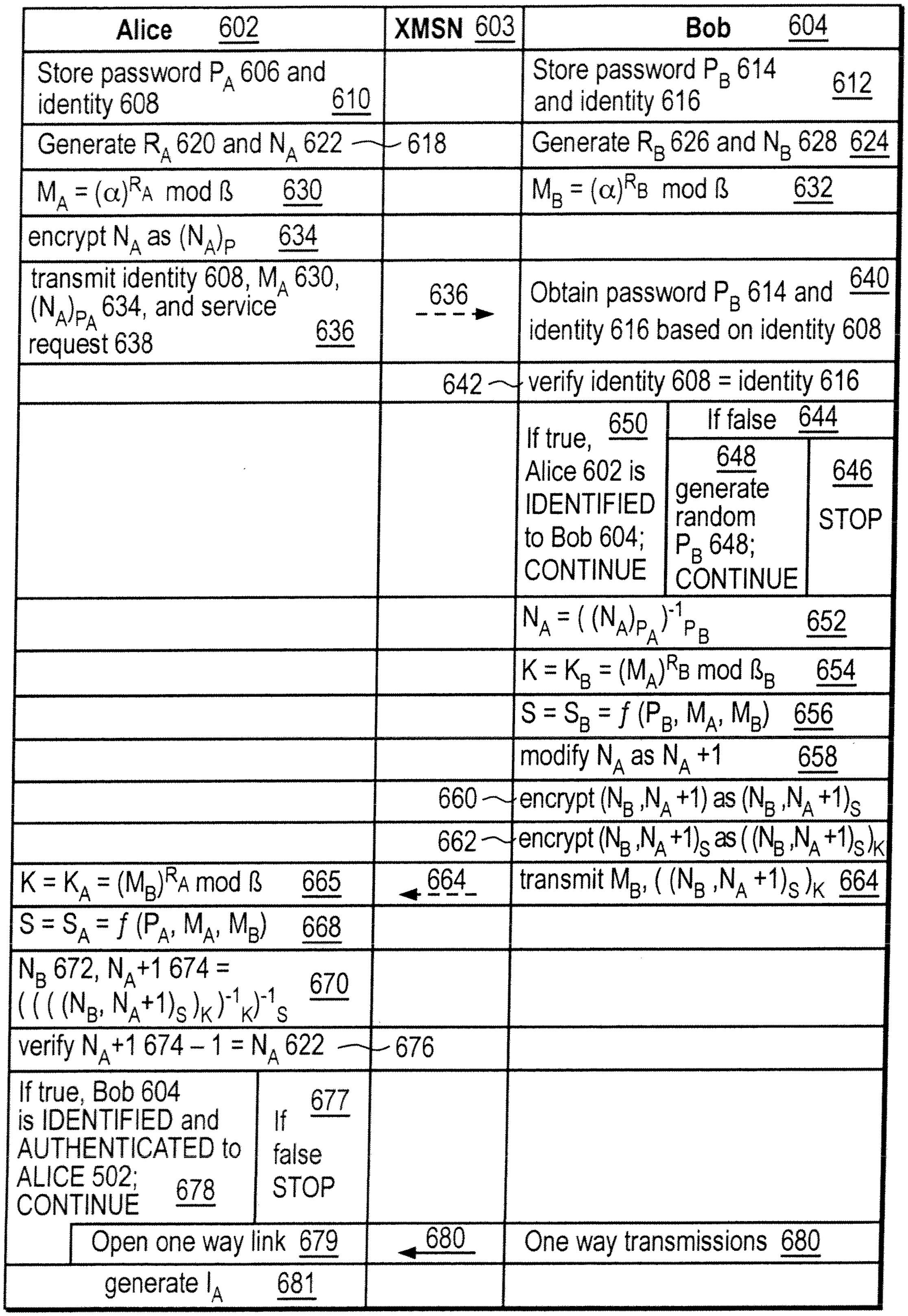
FIG. 5A

500

Alice 502	XMSN 503	Bob 504
		If true, Alice 502 is AUTHENTICATED to Bob 504; CONTINUE 580 If false STOP 579
One way transmissions 582	582 →	Open one way link 581 generate I_B 583
		modify N_A as N_A+1 584
		encrypt I_B, N_A+1 as $(I_B, N_A+1)_S$ 586
		encrypt $(I_B, N_A+1)_S$ as $((I_B, N_A+1)_S)_K$ 588
I_B 591, N_A+1 592 = $((((I_B, N_A+1)_S)_K)-1_K)-1_S$ 590	589 ← - - -	transmit $((I_B, N_A+1)_S)_K$ 589
verify N_A+1 592 – 1 = N_A 562 593		CONTINUE 597
If true, Bob 504 is IDENTIFIED and AUTHENTICATED to Alice 502, CONTINUE 595 If false STOP 594		
Encrypted Two way transmissions 596	599 ↔	Encrypted Two way transmissions 598

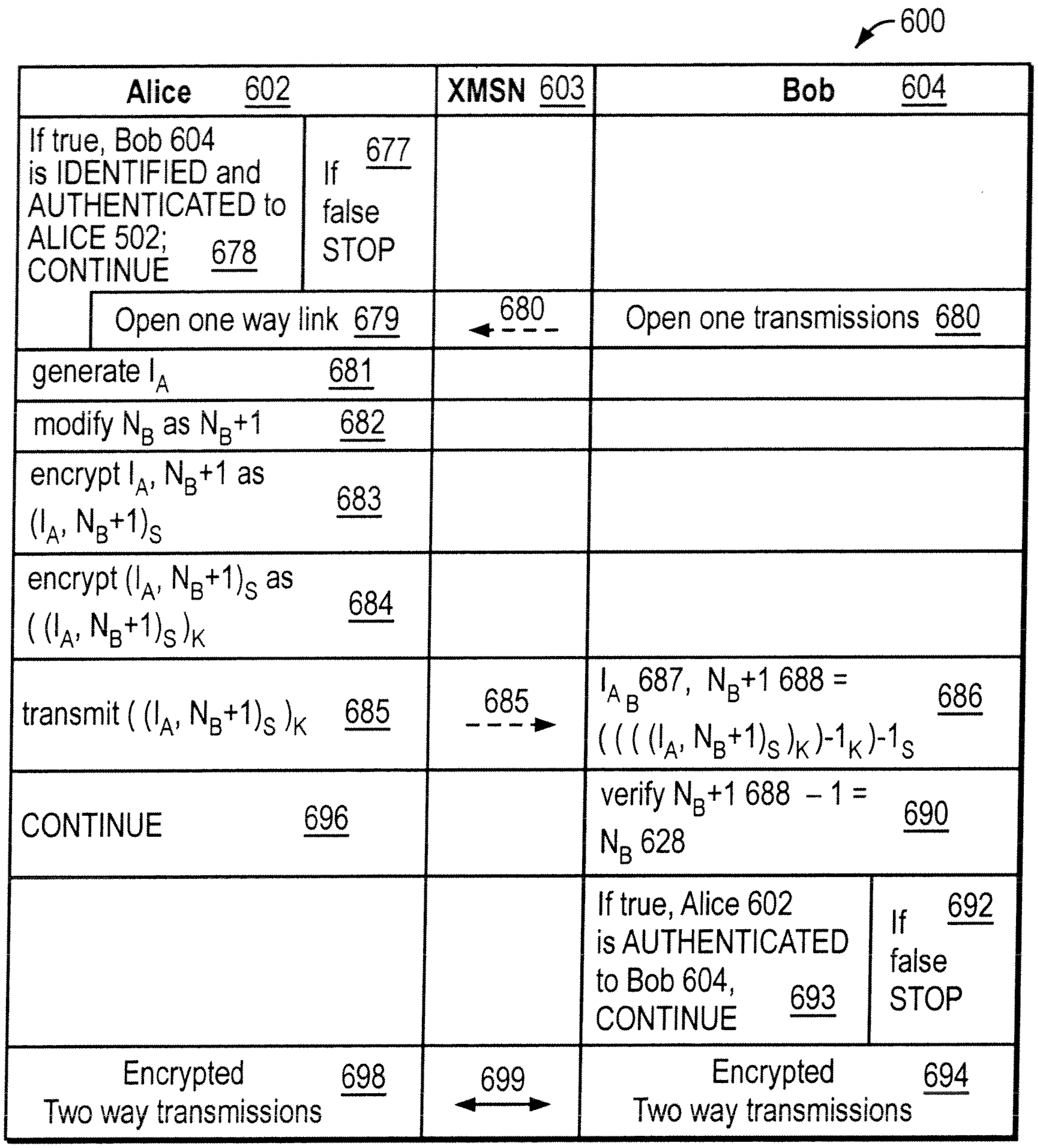
FIG. 5B

600



Alice 602	XMSN 603	Bob 604
Store password P_A 606 and identity 608 610		Store password P_B 614 and identity 616 612
Generate R_A 620 and N_A 622	618	Generate R_B 626 and N_B 628 624
$M_A = (\alpha)^{R_A} \bmod ß$ 630		$M_B = (\alpha)^{R_B} \bmod ß$ 632
encrypt N_A as $(N_A)_P$ 634		
transmit identity 608, M_A 630, $(N_A)_{P_A}$ 634, and service request 638 636	636 $\dashrightarrow$	Obtain password P_B 614 and identity 616 based on identity 608 640
	642	verify identity 608 = identity 616
		If true, 650 Alice 602 is IDENTIFIED to Bob 604; CONTINUE If false 644 648 generate random P_B 648; CONTINUE 646 STOP
		$N_A = ((N_A)_{P_A})^{-1}{}_{P_B}$ 652
		$K = K_B = (M_A)^{R_B} \bmod ß_B$ 654
		$S = S_B = f(P_B, M_A, M_B)$ 656
		modify N_A as $N_A + 1$ 658
	660	encrypt (N_B, N_A+1) as $(N_B, N_A+1)_S$
	662	encrypt $(N_B, N_A+1)_S$ as $((N_B, N_A+1)_S)_K$
$K = K_A = (M_B)^{R_A} \bmod ß$ 665	← 664	transmit M_B, $((N_B, N_A+1)_S)_K$ 664
$S = S_A = f(P_A, M_A, M_B)$ 668		
N_B 672, N_A+1 674 = $((((N_B, N_A+1)_S)_K)^{-1}{}_K)^{-1}{}_S$ 670		
verify N_A+1 674 – 1 = N_A 622	676	
If true, Bob 604 is IDENTIFIED and AUTHENTICATED to ALICE 502; CONTINUE 678 677 If false STOP		
Open one way link 679	← 680	One way transmissions 680
generate I_A 681		

FIG. 6A



Alice 602		XMSN 603	Bob 604	
If true, Bob 604 is IDENTIFIED and AUTHENTICATED to ALICE 502; CONTINUE 678	If false STOP 677			
Open one way link 679		← 680	Open one transmissions 680	
generate I_A 681				
modify N_B as N_B+1 682				
encrypt I_A, N_B+1 as $(I_A, N_B+1)_S$ 683				
encrypt $(I_A, N_B+1)_S$ as $((I_A, N_B+1)_S)_K$ 684				
transmit $((I_A, N_B+1)_S)_K$ 685		685 →	I_{A_B} 687, N_B+1 688 = $((((I_A, N_B+1)_S)_K)\text{-}1_K)\text{-}1_S$ 686	
CONTINUE 696			verify N_B+1 688 − 1 = N_B 628 690	
			If true, Alice 602 is AUTHENTICATED to Bob 604, CONTINUE 693	If false STOP 692
Encrypted Two way transmissions 698		699 ↔	Encrypted Two way transmissions 694	

FIG. 6B

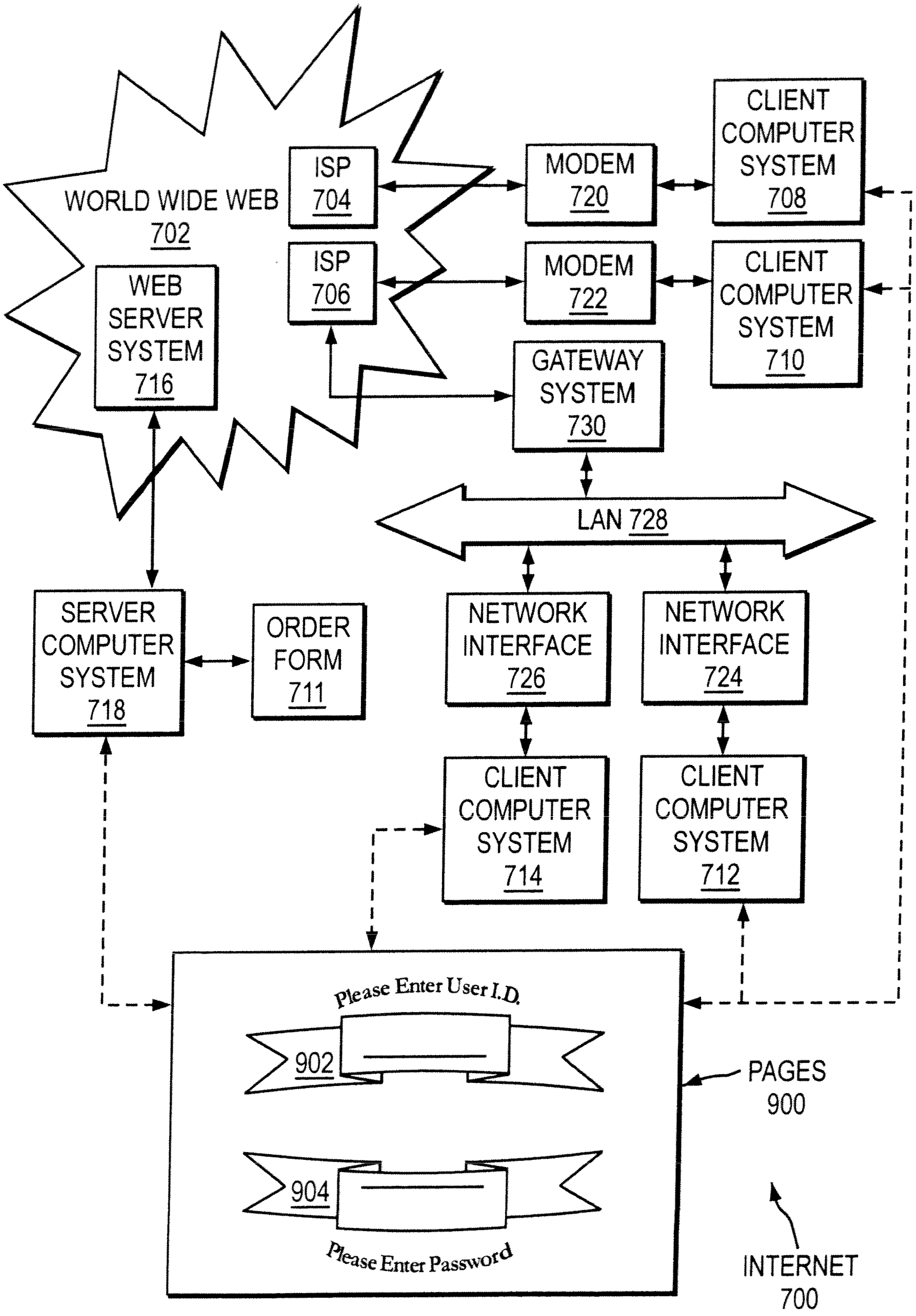

WORLD WIDE WEB 702
ISP 704
ISP 706
MODEM 720
MODEM 722
CLIENT COMPUTER SYSTEM 708
CLIENT COMPUTER SYSTEM 710
WEB SERVER SYSTEM 716
GATEWAY SYSTEM 730
LAN 728
SERVER COMPUTER SYSTEM 718
ORDER FORM 711
NETWORK INTERFACE 726
NETWORK INTERFACE 724
CLIENT COMPUTER SYSTEM 714
CLIENT COMPUTER SYSTEM 712
Please Enter User I.D.
902
904
Please Enter Password
PAGES 900
INTERNET 700

FIG. 7

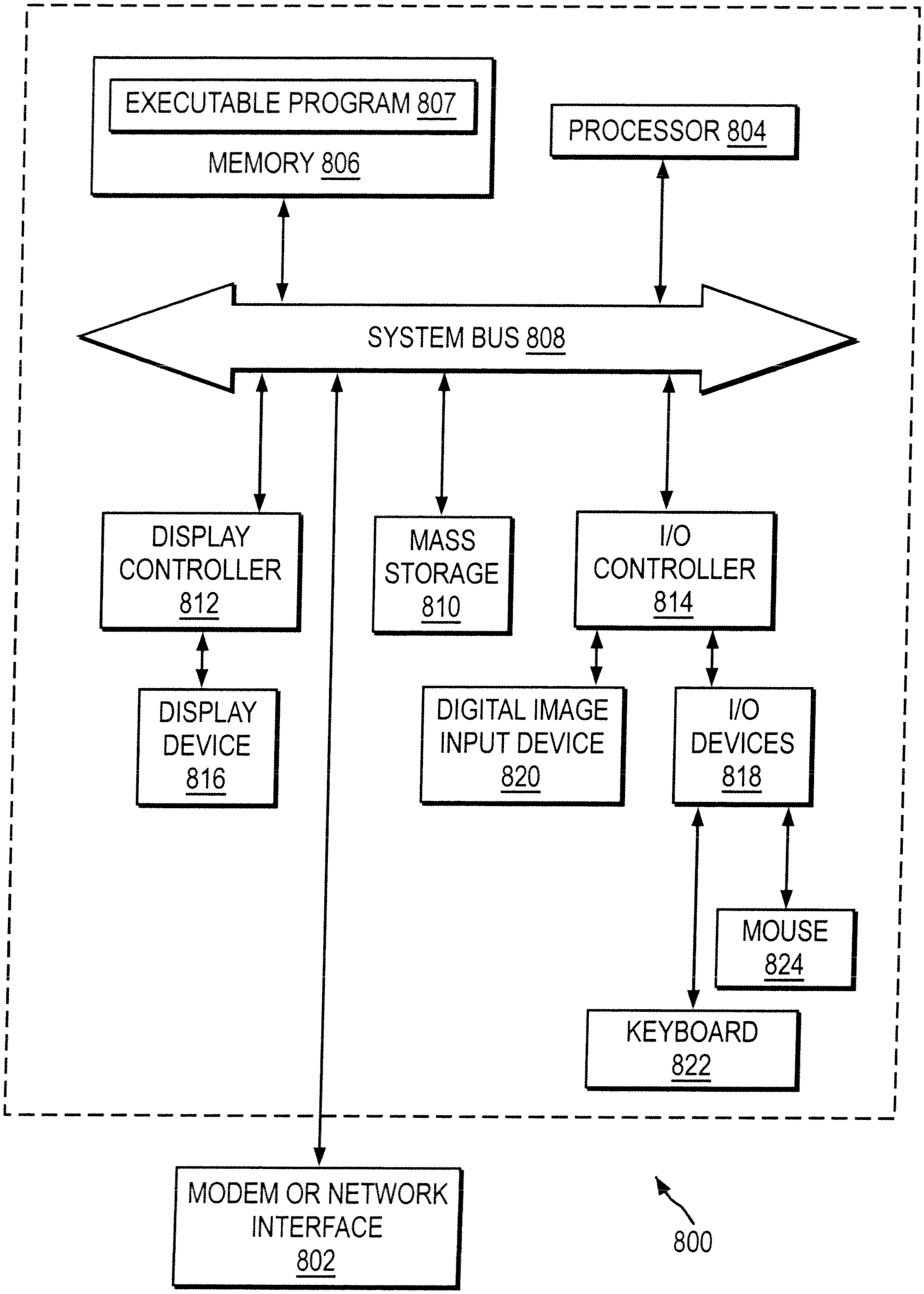

EXECUTABLE PROGRAM 807
MEMORY 806
PROCESSOR 804
SYSTEM BUS 808
DISPLAY CONTROLLER 812
MASS STORAGE 810
I/O CONTROLLER 814
DISPLAY DEVICE 816
DIGITAL IMAGE INPUT DEVICE 820
I/O DEVICES 818
MOUSE 824
KEYBOARD 822
MODEM OR NETWORK INTERFACE 802
800

FIG. 8